EPA
Region 8

U.S. Environmental Protection Agency
Region 8
999 18th Street
Suite 500, 8EPR-ER
Denver, Colorado 80202-2466

Kootenai Development Company
Kootenai Bluff Property
FINAL Removal Action Work Plan

Libby, Montana Asbestos Emergency Response Project

August 14, 2001 FINAL

Prepared by:

U.S. Department of Transportation
Research and Special Programs Administration

John A. Volpe National Transportation Systems Center
Environmental Engineering Division, DTS-33
55 Broadway, Kendall Square
Cambridge, Massachusetts 02142

Contractor support provided by:

CDM Federal Programs Corporation
One Cambridge Place
50 Hampshire Street
Cambridge, Massachusetts 02319

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Section 1
Introduction

1.1 Project Understanding

The Environmental Engineering Division (DTS-33) of the John A. Volpe National Transportation Systems Center (Volpe Center) is providing environmental engineering and contaminant removal support to Region 8 of the U.S. Environmental Protection Agency (EPA). The Volpe Center and their contractor, CDM Federal Programs Corporation (CDM) and it's subcontractor, Pacific Environmental Services, Inc. (PES), along with the Volpe Center's removal/demolition contractor, Environmental Chemical Corporation (ECC), have been requested to prepare a Removal Action Work Plan (RAWP), and Remedial Action Cost Estimate for the Libby Asbestos Project in Libby, Montana. The Volpe Center is managing this effort with assistance from their A/E contractor CDM, CDM's subconsultant, PES, and the Volpe Center's removal contractor, ECC.

The Libby Asbestos Project includes removal of asbestos contaminated soil at the KDC Kootenai Bluff property located across the river from the former Screening Plant (Operable Unit 02). It is our understanding that EPA has designated the work at the former KDC Kootenai Bluff property site as a fund-lead.

1.2 Background Information for the KDC Kootenai Bluff Property

Information included in this section was obtained during previous investigations for the Kootenai Development Company, owners of the KDC Kootenai Bluff property. Figure 1-1 provides the general locus plan of the Libby, Montana area. Figure 1-2 provides the location of the KDC Kootenai Bluff property in relation to the vermiculite mine site on the U.S. Geological Survey (USGS) quadrangle map. The property was previously known as Government Lots 2 and 3.

1.2.1 Current Site Usage

This site is currently vacant, undeveloped land consisting of meadow and sparsely wooded vegetation. A paved haul road bisects the project site and runs roughly 750-feet from and parallel to the Kootenai River. A copy of a certificate of survey prepared by J.R.S. Surveying, Inc. indicates that a subdivision plan has been drawn which divides the property into twelve (12) building lots. During site walkovers, no lot corner markers were found. Underground electrical and telephone lines may have been installed as access boxes and transformers have been installed along the Haul Road. The property includes an active rail line operated by the Burlington Northern Santa Fe (BNSF) Railroad. The railroad tracks are located within a 200-foot wide easement that runs along the eastern portion of the project site. Photographs of the KDC Kootenai Bluff property taken during preliminary investigations are provided in Appendix A.

Color Chart(s)

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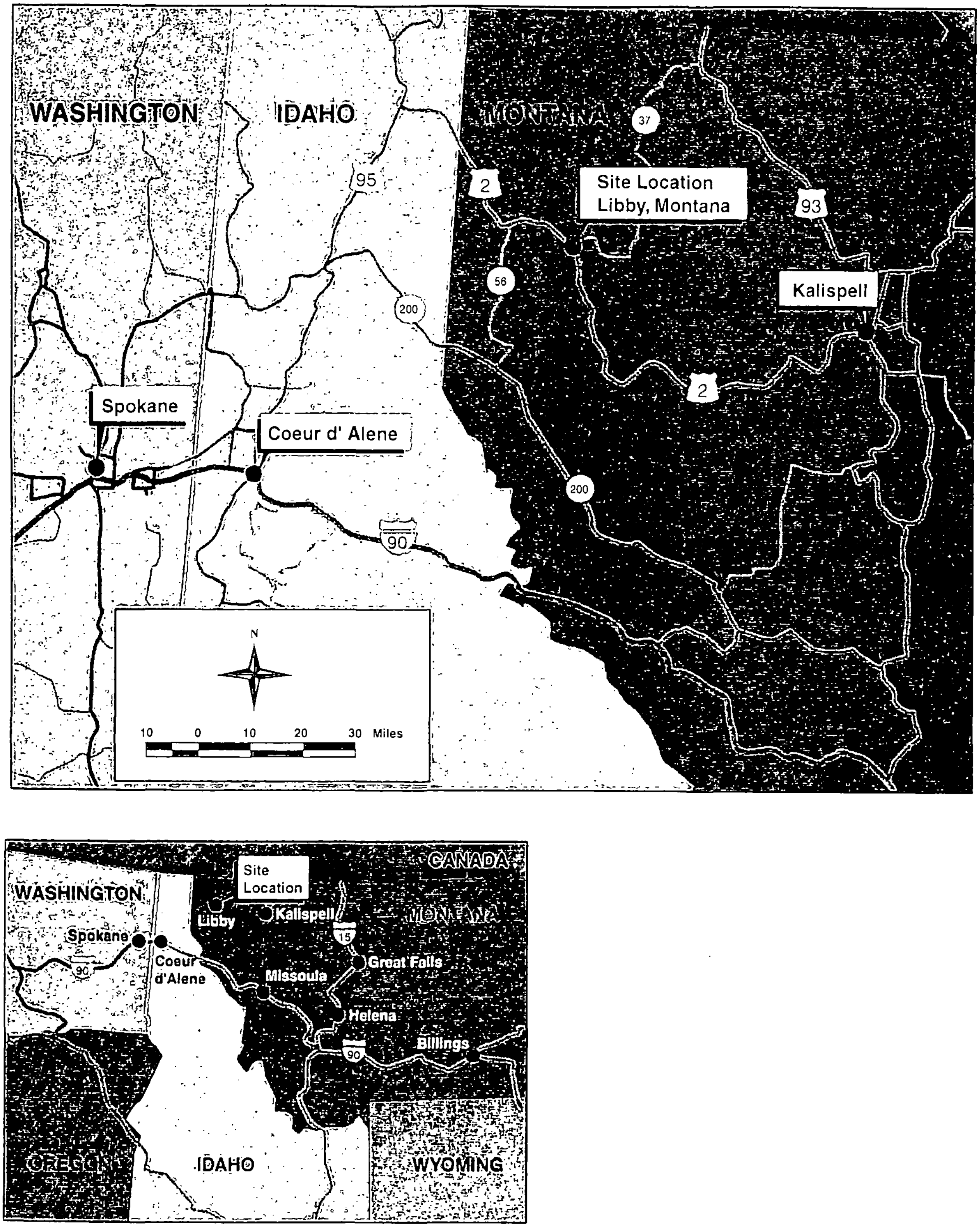

Figure 1-1
Site Locus Plan
Libby, Montana

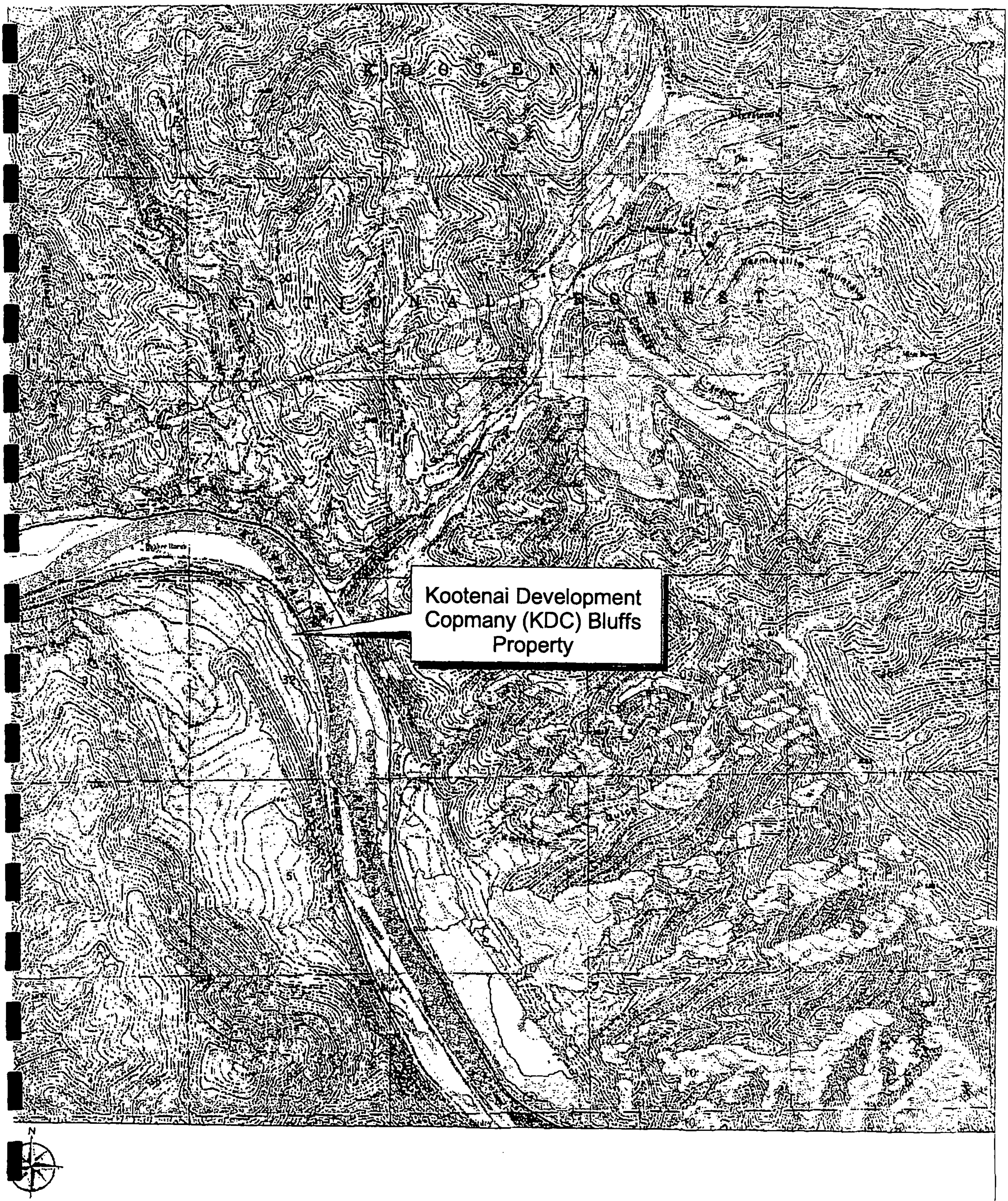

Figure 1-2
Site Location

DM Federal Programs Corporation

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1.2.2 Historic Site Usage

The KDC Kootenai Bluff property consists of undeveloped land, and does not appear to have been associated with a previous commercial use. Since the former Loading Facility was located at the railroad tracks opposite the Screening Plant site on Highway 37, some spillage or dumping of vermiculite likely occurred on the property.

1.2.3 Site Area (Acreage)

Total site acreage includes the area occupied by the haul road and railway right of way. The site contains approximately 63.41 acres (according to a copy of the subdivision plan prepared by J.R.S. Surveying, Inc., Figure 1-3), located on the southwest side of the Kootenai River, approximately 4.5 miles northeast of Libby, Montana. The overall dimensions of the site are approximately 965 +/- feet on the north; approximately 2,850 +/- feet along the Kootenai River on the east; approximately 3,550 +/- feet (in three courses) on the south; and approximately 1,186 +/- feet on the west.

1.2.4 General Site Condition

The KDC Kootenai Bluff property is accessed via Haul Road that passes through the property. Access to the interior of the eastern portion of the site is either on foot, or vehicular access is gained through a gated entrance off of the haul road to a network of gravel cart paths. These gravel roads allow access to the railroad track bed and also meander through the property and connect back to the paved haul road in the southern portion of the project site. Unimproved roads are in fair condition; however, vermiculite was visible at a number of locations on and adjacent to these roads. Road access to the site appears to be adequate to support future removal activities. Figure 1-3 displays the general layout of this site.

1.2.5 Soil Conditions

Soil conditions observed during preliminary investigations reveal that site soils consist of medium grained sand, cobbles (6 inch minus) and boulders. Topsoil at the site has sandy loam soil containing some silts and clay. Vermiculite was observed in some surface soils adjacent to and on access roads. Test pits have been excavated and soil samples have been collected from the project site. Sampling locations for which analytical results are available at this time are shown on Figure 1-4 and Figure 1-5. The final design documents will include additional analytical data for soil samples recently collected.

1.2.6 Existing Infrastructure and Utilities

Paved access roads, telephone, and electrical power are believed to be available at this site as transformers and access pedestals have been installed along the paved Haul Road. A drilled well was observed adjacent to the railroad tracks in the vicinity of the former vermiculite loading area. It is unknown if a pump is in the well, wired and available for use.

SURVEY DATA FROM J.R.S.SURVEYING INC.
TOPOGRAPHIC SURVEY PLAN

PLAN VIEW: NOT TO SCALE

U.S. DEPARTMENT OF TRANSPORTATION
RESEARCH AND SPECIAL PROGRAMS ADMINISTRATION

JOHN A. VOLPE NATIONAL TRANSPORTATION SYSTEMS CENTER
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CONTRACTOR SUPPORT PROVIDED BY:

CDM Federal Programs Corporation
A Subsidiary of Camp Dresser & McKee Inc.

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50 HAMPSHIRE STREET
CAMBRIDGE, MASSACHUSETTS 02139

KOOTENAI DEVELOPMENT COMPANY
KOOTENAI BLUFF SUBDIVISION
LIBBY, MONTANA

FIGURE 1-3

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Libby, Montana

Figure 1-4
Kootenai Bluff North

Kootenai Bluff Sample Labels

Asbestos Levels
In Soil (by PLM)

Worst Case Samples
- ○ No Sample Data
- ○ <1%
- ● ≥1%

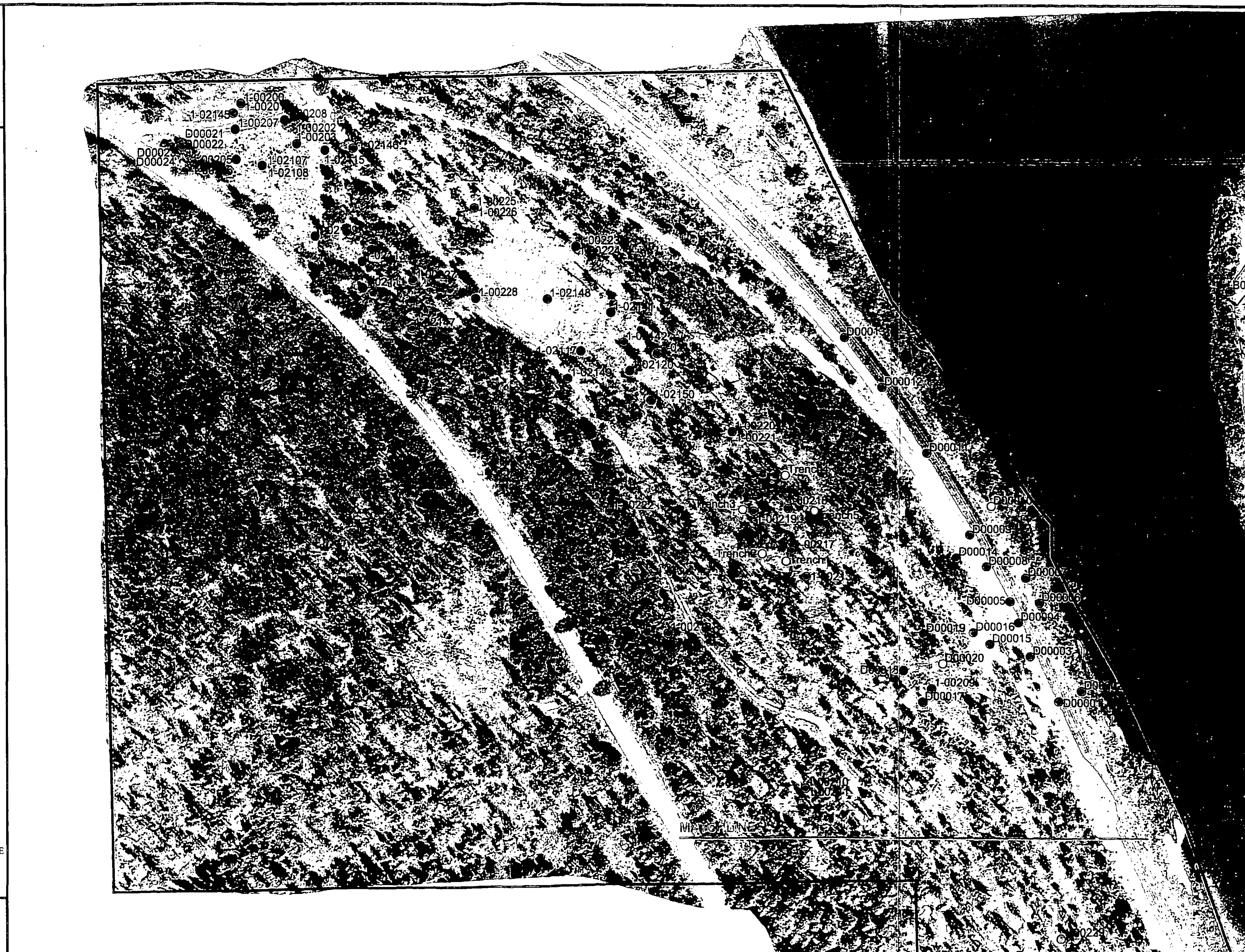
June 13, 2001

Map Projection UTM Zone 11 NAD83FT

CDM Federal Programs Corporation

1 Inch = 150 Feet

150 0 150



Libby, Montana
Figure 1-5
Kootenai Bluff South

Kootenai Bluff Sample Labels

Asbestos Levels
In Soil (by PLM)

Worst Case Samples

- ○ No Sample Data
- ○ <1%
- ● ≥1%

June 13, 2001

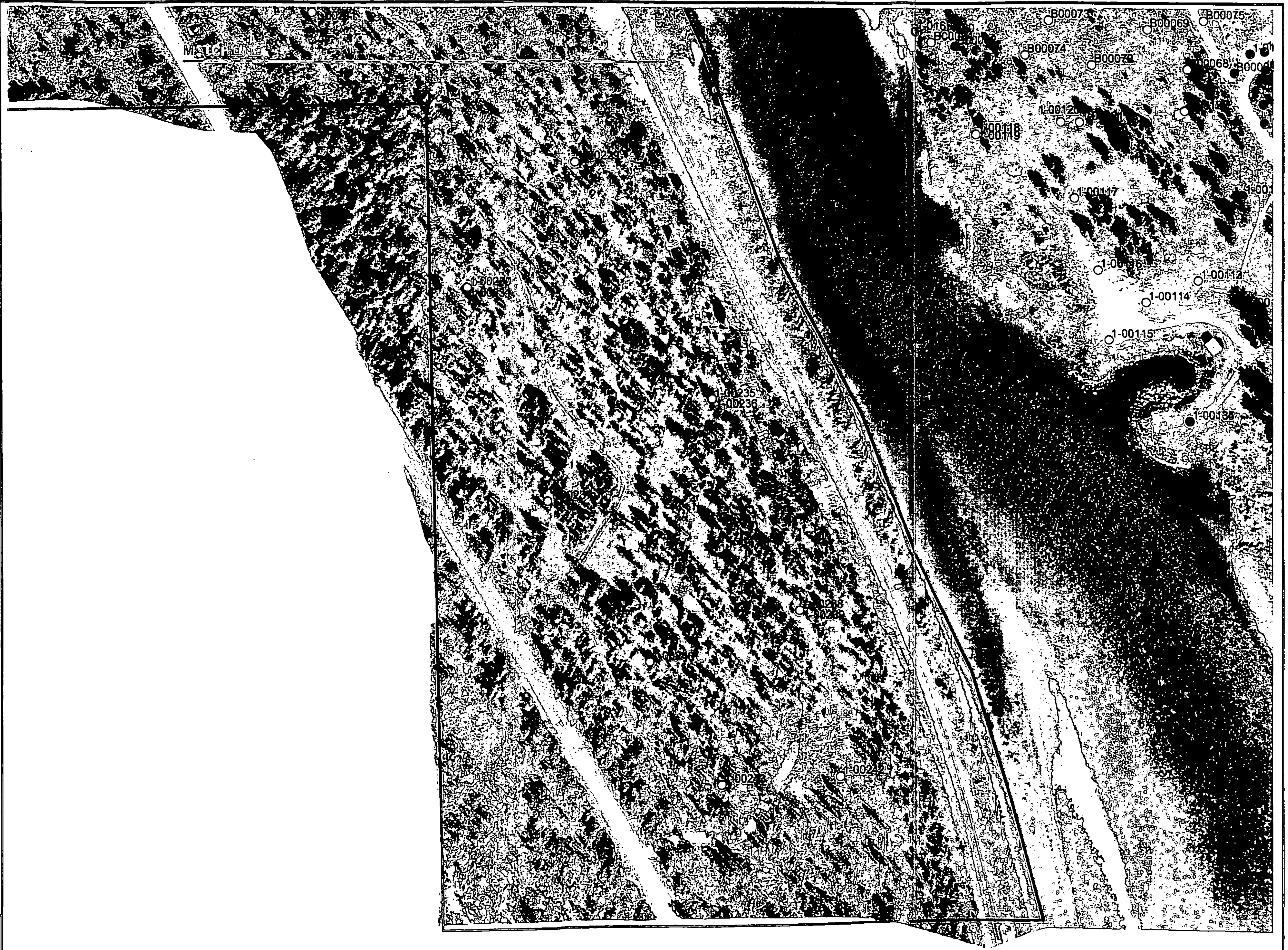
Map Projection UTM Zone 11 NAD83FT

N
W E
S

CDM Federal Programs Corporation

1 Inch = 150 Feet

150 0 150



1.2.7 Availability of Water

Water was previously provided to the site by a cased water well drilled near the railroad track bed. It is uncertain whether this well is still in service. CDM believes the well has been abandoned and is presently inoperable.

1.2.8 Existing Vegetation

Existing vegetation consists of grass, and small to medium growth trees of various types and ages.

1.2.9 Surrounding Properties

The property lies along the west side of the Kootenai River. Properties to the north, west, and south consist of undeveloped, wooded land.

1.2.10 Excavation Considerations

Excavation at the site should be conducted in a careful and cautious manner. A test pit excavation program to provide subsurface soil information is recommended prior to full-scale excavation activities beginning at the site. The removal contractor will be required to contact *Dig Safe* prior to any removal activities on the property. The extent of underground telephone and electrical service at the property will need to be provided by each respective utility company. In addition, the following items will need to be considered when planning an excavation program at the site:

- Dust control
- Trucking access
- Site security
- Erosion control
- Underground utilities
- Site safety

1.2.11 Cultural and Historical Impacts

There are no known cultural sites of archaeological or historical significance on the subject property.

1.2.12 Special Considerations

It is presently planned to remove 18 inches of soil from areas of the site determined by surface soil sampling to contain asbestos contaminated soils. In these locations, confirmatory soil sampling will be performed at the 18-inch depth and at 6-inch intervals thereafter. If contaminated soils are found, excavation and confirmatory sampling will continue in 6-inch intervals to a depth of 4 feet. The maximum depth of soil to be removed from confirmed contaminated areas of the site is 4 feet.

Section 2
Work Planned for 2001

2.1 Planning Activities

2.1.1 Introduction

The Construction Quality Assurance Plan and Engineering Drawings and Technical Specifications developed in 2000 for the removal activities started in 2000 at Operable Unit 02 will remain in effect for 2001 at all sites where asbestos-containing soils will be removed.

2.1.2 Prepare Health and Safety Plan Requirements

CDM is preparing a comprehensive Health and Safety Plan (HASP) for the site. An individual contractor may develop its own HASP in accordance with that company's corporate policy; however, each contractor will be responsible for conducting its work and the work of its subcontractors in compliance with the comprehensive HASP for the site. The comprehensive Health and Safety Plan will be developed and implemented in accordance with the U.S. Occupational Safety and Health Administration (OSHA) Standard 29 CFR Part 1910 and Part 1926, Occupational Safety and Health Standard for the Construction Industry, and all applicable OSHA Health and Safety Requirements.

The Health and Safety Plan will be reviewed and approved by a Certified Industrial Hygienist (CIH) prior to initiating removal actions. All modifications to the Health and Safety Plan that are required during the removal action at the site will also be reviewed and approved by the project CIH prior to being implemented. The Health and Safety Plan will be included in the removal action specifications and will address the following:

- Overview of the potential hazards at the work site
- Identification of safe work practices
- Training and medical monitoring requirements
- Personal protective equipment requirements
- Communication and emergency notification procedures
- Project documentation

Once the site specific Health and Safety Plan has been approved by the CIH, the removal contractor will review the plan with all removal action personnel. All removal actions at this site will be conducted in strict accordance with the approved site specific Health and Safety Plan.

2.1.3 Prepare Air Monitoring Requirements

2.1.3.1 Perimeter and Ambient Air Monitoring

Background ambient air samples, ambient air samples during the removal action, and final clearance ambient air samples will collected at eight fixed perimeter monitoring sites. These eight sites surround the regulated emergency removal action area. Two sites are located on the northern perimeter of the site, two sites along the southern perimeter, two on the eastern perimeter, and two on the western perimeter. The locations of these sites were selected to ensure that airborne asbestos fiber concentrations migrating from the regulated removal action could be determined independent of wind direction or work location. Additional fixed perimeter locations may be added during the course of the project. The number and location of these additional fixed perimeter samples will be determined by the air-monitoring consulting firm along with EPA and the Volpe Center. The actual locations will be selected in the field and surveyed using a resource-grade GPS instrument.

In addition to the perimeter air samples, additional ambient air samples will be collected depending on the day's work activities. These samples will be collected at locations such as the decontamination chambers, negative air machines, contractor trailers, etc. The number and location of these additional ambient air samples will be determined by the air-monitoring consulting firm along with EPA and the Volpe Center.

2.1.3.2 Personal Air Monitoring

Personal air sampling on the removal action contractor's (ECC) workers will be conducted to document compliance with 29 CFR Part 1926.1101. All personal air samples will be collected and analyzed by EMSL Analytical Inc. (EMSL) in accordance with 29 CFR 1926.1101.

2.1.3.3 Sample Identification

Each air sample is identified by a unique code. The code is an index identification code taken from the same list of unique codes prepared by Syracuse Research Corporation (SRC), a contractor to EPA, as used for soil sampling. This coding system is designed to prevent accidental duplication of sample identification numbers and ensures that all samples have a unique identification number assigned to them. These codes start from 1R-00001 and the last five numbers are sequentially numbered so that thousands of unique codes are available, if necessary. To ensure that the laboratory is "blind" and does not receive certain specific information about a sample, only the index identification code, along with sample date and time, is being used to label air sample cassettes.

Air samples will not be assigned a second sample code. Sample details are being noted in the air sampling log sheets and field logbooks.

2.1.3.4 Collecting Samples

Air samples will be collected by drawing air through a cellulose acetate filter (0.8 mm pore size) at a specified flow rate for a specified period of time. The details of the method are provided in EPA SOP 2015. During normal working activities, both ambient and personal air samples will be collected at a flow rate of 2.5 liters per minute (l/min) over an 8-hour sampling period. This results in a total sampling volume 1200 liters.

Depending on the sampling conditions, work activities, the level of asbestos in the air, and the level of interfering particles in the air, the flow rate, total sampling time, and/or sampling volume may require modifications. The decision to modify the flow rate, time, or volume will be made by the air-monitoring consultant in conjunction with the EPA OSC.

2.1.3.5 Sample Custody, Documentation, Packaging, and Shipping

Sample custody includes the classifying, identifying, labeling, packaging, and transporting of samples collected during this investigation.

Sample classification is necessary to ensure the protection of personnel involved in the shipment of samples, and to maintain the integrity of each sample. Air samples collected during the removal action are classified as either ambient or personal air monitoring samples.

To maintain a record of sample collection, transfer between personnel, shipment, and receipt by the laboratory, COC records will be used. The COC record is employed as physical evidence of sample custody and control, and provides the means to identify, track, and monitor each individual sample from the point of collection through final data reporting. COC procedures follow the requirements set forth in CDM Federal SOP 1-2, Sample Custody, with modifications. The following modifications to SOP 1-2 have been reviewed and approved:

<u>Section 5.2, Sample Labels and Tags</u> – A pre-generated label is being affixed to each air sampling cassette prior to being shipped to the appropriate laboratory. This number corresponds to the number assigned to that particular sample in the EPA database.

Samples collected during this investigation that require analysis at off-site laboratories (i.e., not at the mobile laboratory in Libby) are being packaged and shipped in accordance with CDM Federal SOP 2-5, Packaging and Shipping of Environmental Samples (Appendix B), with modification. The following modifications to SOP 2-5 should be noted:

<u>Section 4.0, Required Equipment</u> - No vermiculite or other absorbent material is being used. No bubble wrap or ice is being used.

2.1.3.6 Sample Archiving

Samples will be retained at the field laboratory after analysis until the end of each week at which time they are shipped to EMSL Analytical, Robert DeMalo, 107 Haddon Avenue, Westmont, NJ 08108 where they will be archived for possible future evaluation.

2.1.3.7 Equipment Decontamination

This project requires the decontamination of all air sampling equipment (e.g., pumps, cassette holders, etc.) that is used within the regulated emergency response action area prior to it being removed from that area. All air sampling pumps, tubing, sampling stands, and rotometers will be decontaminated at the end of each sampling day. All equipment will be wiped down with deionized water and dried with clean disposable wipes or rags. These rags will be disposed of as asbestos-contaminated waste. Once the equipment has been decontaminated, it is stored outside of the regulated area during non-sampling hours.

2.1.3.8 Health and Safety

All sampling is being performed in accordance with all applicable EPA, OSHA, corporate, and site health and safety requirements. CDM Federal has prepared a SHASP for the Removal Action.

2.1.4 Prepare Construction Quality Control and Quality Assurance Plan

The text portion of the Sampling and Quality Assurance Project Plan developed by EPA is provided in Appendix B. Applicable requirements of this plan will be implemented during the removal activities described in this RAWP.

2.1.5 Decontamination and Dust Suppression Requirements

2.1.5.1 Decontamination Procedures

Construction equipment such as backhoes and trucks will be decontaminated prior to leaving the project work site. Removal action personnel will be required to decontaminate themselves at the end of each work shift before leaving the project work site. Prior to the start of the removal actions, site specific decontamination and cleaning procedures will be developed by the removal contractor and reviewed by the Government. The procedures shall address decontaminating personnel and construction equipment. The following paragraphs provide an overview of the decontamination and cleaning activities.

2.1.5.2 Personnel Decontamination

The removal contractor will furnish and install a single personnel decontamination facility at the site for male and female removal action workers to shower at the completion of each work shift. Administrative controls will be utilized to control different times for use by men and separate times for use by women. The decontamination facility will consist of a minimum of a clean room, shower room, and dirty room separated by air locks. The facility will have hot and cold running water, and will have a negative air system that prevents fibers from being released into the clean room. All shower water will be filtered to remove asbestos fibers before being released to the environment. Workers will enter the dirty room, remove their protective clothing, step into the shower room and shower, then enter the clean room before taking work breaks or leaving the work site for the day. The personnel decontamination facility will be available for use by the engineer, federal, and state agency personnel throughout the duration of the project.

2.1.5.3 Decontamination of Construction Equipment

A variety of construction equipment and vehicles, such as backhoes, loaders, dump trucks and bobcats, will require decontamination before leaving the job site to prevent asbestos contaminated soil from being tracked off site. The removal contractor will be required to construct a decontamination facility and asphalt paved roadway at the site to decontaminate equipment and vehicles. The equipment or vehicles to be decontaminated will be driven to the pad and washed with water from a source approved by the Government to remove visible signs of soil and mud from the exterior of the equipment or vehicle. The water will be collected for filtration and/or disposal in accordance with the removal contractor's approved Health and Safety Plan.

2.1.5.4 Dust Suppression Procedures

The removal action will include dust suppression procedures to prevent asbestos contaminated dust from migrating off the removal action site. The removal contractor will be required to implement dust control on all roads traveled, including Rainy Creek Road, by trucks hauling waste to the abandoned mine site. The removal action specifications include requirements for dust suppression that include the use of water trucks on the site and on Rainy Creek Road. Should water alone fail to provide adequate dust suppression, the Government may require the contractor to dispense liquid magnesium chloride with the water trucks.

Water spraying and misting will be required continuously during excavation and related activities. CDM subcontractor PES will conduct visual observations and air monitoring of the site to monitor the effectiveness of the removal contractor's dust suppression techniques.

2.1.6 Supplemental Soil Sampling

In accordance with EPA directives, additional soil samples recently obtained from the KDC Kootenai Bluff property will be analyzed for the presence of asbestos by the PLM method. GPS coordinates of each sample point will be obtained and, along with laboratory analytical results, entered into the EPA project database. Sample results and visual observations will be used to determine areas at the KDC Kootenai Bluff property where asbestos-containing soils exceed removal action criteria and require excavation and disposal.

Soil sampling along the BNSF Railroad track bed easement, the Kootenai River bank and the land bank east of the BNSF Railroad easement are not addressed in this RAWP.

2.1.7 Engineering Drawings and Technical Specifications

The following technical specification sections have been developed and will be implemented during the 2001 removal actions at the site:

Section	Description
Division 1	*General Requirements*
01010	Scope of Work
01035	Control of Work
01100	Special Project Procedures
01110	Environmental Protection Procedures
01300	Submittals
01311	Construction Scheduling
01580	Project Identification and Signs
01590	Temporary Facilities
01700	Contract Closeout
Division 2	*Sitework*
02040	Decontamination
02050	Decontamination, Demolition and Removals
02200	Earthwork
02230	Granular Fill Materials
02250	Watering
02270	Sedimentation and Erosion Control
02713	Stormwater Management
02776	High Density Polyethylene Membrane Liner
02830	Chain Link Fences
02910	Seeding
02920	Hydroseeding

Division 13	*Special Construction*
13574	Collection, Storage, Sampling, Transportation and Disposal of Liquid Waste
13615	Transportation and Disposal of Non-Hazardous and/or Hazardous Material
13617	Disposal of ACM Rubble, Facilities, Building Contents, and Soil
13680	Health and Safety
13695	Draining, Removal and Disposal of Light Fixture Ballasts, Transformers, Mercury Switches and Oil or Other Liquid-Filled Equipment
13705	Asbestos Abatement
13720	Dust Suppression
13780	Air Monitoring (Performed by the Government's Air Monitoring Consultants)

2.1.8 Erosion Control

Erosion controls consisting of staked hay bales and silt screen fabric will be installed by the removal contractor in locations approved by the Government prior to starting excavation at the KDC Kootenai Bluff property.

2.1.9 Final Site Restoration

The KDC Kootenai Bluff property will be restored to a condition similar to that which existed prior to soil removal activities. Once the excavation of asbestos contaminated soils is complete, all excavated areas shall be backfilled with common fill approved by the Government and compacted in accordance with the technical specifications and all Government requirements. Final grading, loaming, and hydroseeding shall be performed in a manner such that all disturbed areas of the property are restored to the original contours.

2.2 Removal Activities

2.2.1 Contractor Mobilization

The Volpe Center's removal contractor, Environmental Chemical Corporation (ECC), is scheduled to mobilize to the KDC Kootenai Bluff property in early summer 2001. ECC has planned to assign the same project superintendent and core support staff that worked at the Screening Plant site in 2000 to the project in 2001. Contractor mobilization includes setting up decontamination and lavatory facilities at the KDC Kootenai Bluff property similar to those provided in 2000. Field offices will be located at the Screening Plant site.

2.2.2 Temporary Facilities

Temporary facilities set up at the Screening Plant site will include a field office for ECC project superintendent and support team. A second field office trailer (60 feet x 14 feet) shall be provided for use by the EPA, Volpe Center staff, and CDM staff. Each office trailer shall be equipped with heat, air conditioning, lighting, and ventilation systems as required by local codes. Temporary field offices shall be secured from the effects of high winds by cable tie downs. Both the Government and the removal contractor's temporary field offices shall be furnished with three telephone lines for telephone communication and three additional telephone lines provided for facsimile transmissions and high speed modem connections. Restroom facilities will be provided within the field office trailers as well as portable units augmented with hand washing stations.

Portable toilets for male and female workers and agency personnel shall be staged in the Support Zone and workers must exit through the personnel decontamination facility in order to access these facilities. The number of toilet seats and urinals shall be in accordance with the requirements of 29 CFR 1910.120(n)(3)(I), however, there shall be at least three portable toilets with hand washing facilities at Operable Unit 02.

Portable toilets shall be emptied and cleaned, and liquids, disinfectants, paper, etc. replaced or resupplied every other day during the removal activities. The removal contractor will provide cleaning services and rubbish removal on a daily basis.

The removal contractor shall provide a temporary source of water for complete personnel and equipment decontamination activities and dust suppression activities.

Perimeter chain link fencing to restrict access to the exclusion zone shall be installed by the removal contractor prior to commencing removal activities at this site. Fencing shall include gates to permit access/egress for vehicles and equipment working on site during work hours. Gates shall be locked at all times when removal activities are not being performed.

2.2.3 Decontamination Facilities

The removal contractor shall provide personnel decontamination facilities of sufficient size to provide adequate room for employees working in the exclusion zone to change clothes, shower, and redress throughout the duration of the project. Personnel decontamination facilities shall be provided with heat, ventilation, hot water, and clean towels at all times. Personnel decontamination facilities shall meet all applicable OSHA requirements.

Vehicle and equipment decontamination facilities shall be constructed in a location approved by the Government. Vehicle and equipment decontamination facilities shall be of sufficient size to thoroughly wash down the largest piece of equipment used on the site.

2.2.4 Tree Protection and Removal

Trees equal to or greater than 6 inches in diameter at a point 4 feet above ground surface shall be protected from damage during soil excavation, backfilling, and restoration activities. Trees to be protected shall be identified by the Engineer.

Trees less than 6 inches in diameter at a point 4 feet above ground surface shall be cut into manageable size pieces and stockpiled by the removal contractor. Wood stockpile locations shall be determined by the Government. All tree cutting and branches shall be disposed at Government approved locations at the abandoned mine site. Stumps of all cut trees shall be excavated and disposed at Government approved locations at the abandoned mine site by the removal contractor in accordance with the approved Transportation and Disposal Plan developed for the Volpe Center by CDM, and currently under review by the Government.

2.2.5 Soil Excavation and Disposal

Excavation of asbestos-containing soils on the KDC Kootenai Bluff property will begin as soon as authorization is received from the Government. Figure 2-1 shows the approximate limits of soil excavation planned for the 2001 construction season, based on soil sample results received to date. From these sample results, it is not anticipated that asbestos contaminated soils are present on the southern portion of the site shown in Figure 1-5. Asphalt pavement will be removed and reduced to manageable size pieces for loading and truck transport to the mine site for disposal. Soil will be excavated to a depth of 18 inches below existing grade. At the 18-inch depth, confirmatory soil samples will be collected and analyzed for asbestos by the PLM method. If asbestos is found at levels requiring removal (> 1 percent), excavation and soil removal with confirmatory sampling will continue in 6-inch increments to a depth of 4 feet. Maximum soil excavation will be to 4 feet below existing grade. A 100 foot x 100 foot sampling grid will be established and post excavation samples will be collected and analyzed using the PLM Method. GPS coordinates of each sample point and corresponding analytical results will be entered into the EPA project database. The excavated soil will be transported by truck to the abandoned mine site and disposed in accordance with the approved Transportation and Disposal Plan.

The Government contractor will contact BNSF Railroad and request that they remove old steel rails and other material that will interfere with the Government's removal actions.

Gravel roads located in areas designated for removal shall be excavated to the same final elevation as the surrounding soils prior to backfilling. Following backfilling, the gravel roads shall be reconstructed using crushed base course type (A), grade 6, as described by the State of Montana, Standard Specifications for Road and Bridge Construction, 1995 edition, adopted by the Montana Department of Transportation and the Montana Transportation Commission.

Color Photo(s)

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To view the actual images, please contact the Superfund Records Center at (303) 312-6473.

Libby, Montana

Figure 2-1

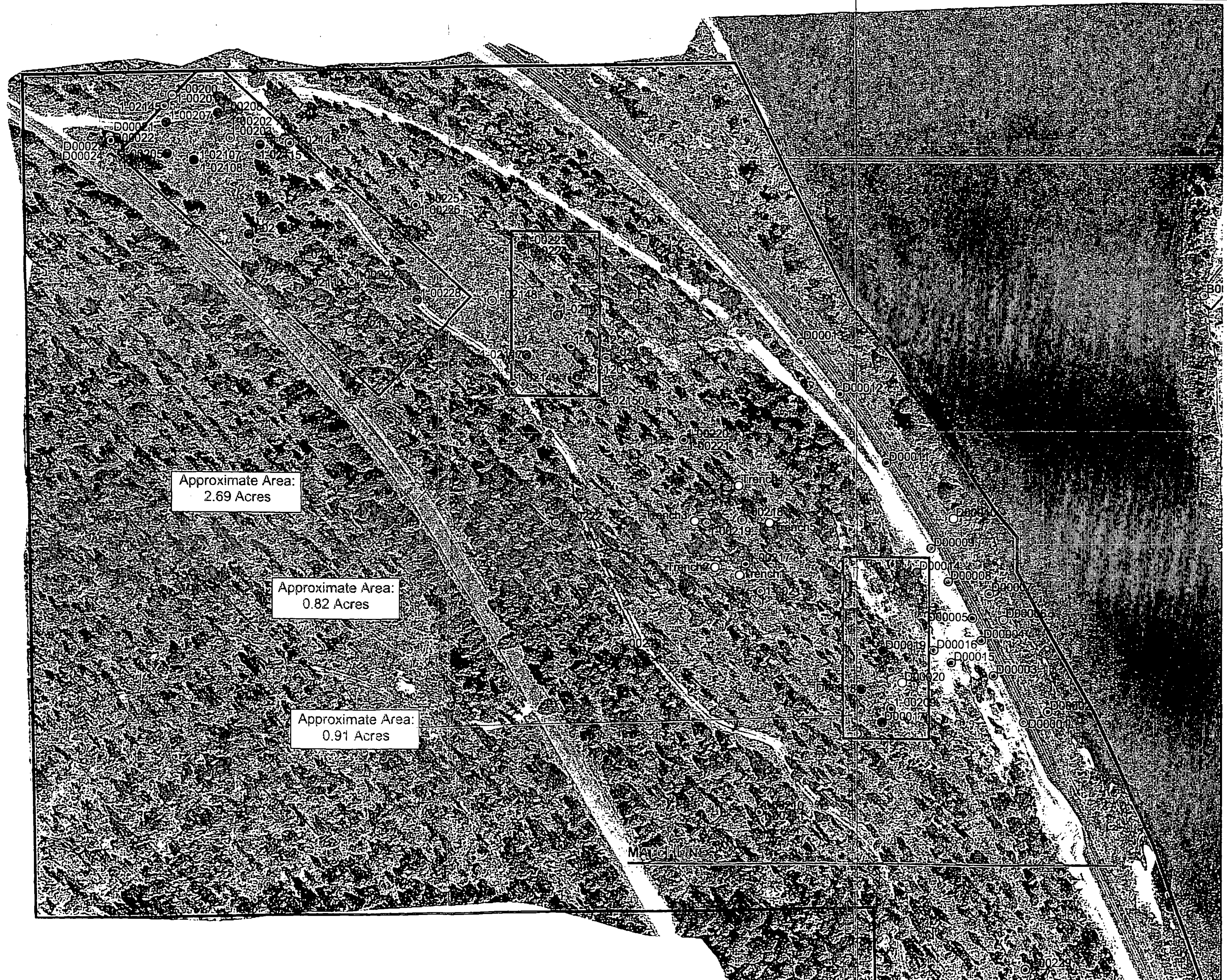
Kootenai Bluff North

Kootenai Bluff Sample Labels

Asbestos Levels
In Soil (by PLM)

Worst Case Samples

- ○ No Sample Data
- <1%
- ≥1%
- Removal Areas



June 13, 2001

Map Projection UTM Zone 11 NAD83FT

N
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CDM Federal Programs Corporation

1 Inch = 150 Feet

150 0 150

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2.2.6 Transportation and Disposal Considerations

Transportation and disposal for this project will be trucking by surface roads to the disposal site at the abandoned mine site. Access to the railroad tracks exists on the site along the Kootenai River, however, based on reasonable objections raised by BNSF during the design stage of the former Screening Plant on the other side of the river, and the availability of more efficient access to the disposal site by truck, transport of contaminated materials from the KDC Kootenai Bluff property by train is not a viable option. All transport and removal from the KDC Kootenai Bluff property will be conducted by truck. The haul route will be developed by the removal contractor and is subject to prior approval by EPA. The haul route will be as described in the Transportation and Disposal Plan.

- Truck loading will need to be done under strict dust control procedures.
- Truck drivers must be asbestos safety trained and wearing appropriate Level C personal protective equipment (PPE) during loading and unloading operations.
- Transportation will be by tarp covered and lined end dump trucks or by belly dump trucks if determined feasible at the disposal site.
- The removal contractor will be required to submit a Traffic Control Plan addressing issues such as flag service and closing of Rainy Creek Road to the general public, loggers, and Forest Service personnel during hauling operations by Government contractors during removal operations.
- Excavated soils will be disposed in the locations approved by the Government at the abandoned vermiculite mine and then covered.
- The removal contractor will be required to submit a Dumping/Dust Control Plan for dumping at locations approved by the Government at the abandoned vermiculite mine for review by the Volpe Center and EPA prior to mobilizing onto the site.

2.2.7 Backfilling and Compaction

Backfill material shall meet the requirements of Specification Section 02200 for common fill and gravel road base and surface course and be in all respects approved by the Government. Backfill shall be placed in 12-inch and 6-inch lifts as specified and compacted in accordance with Specification Section 02200. Troxler nuclear density tests shall be performed on each layer of common fill placed and compacted on the site. Final grades shall be returned to original grades on the site prior to soil excavation activities.

2.2.8 Topsoil and Hydroseeding

Once common fill has been placed, compacted, and accepted by the Government, 6 inches of topsoil shall be placed over all disturbed areas. Topsoil shall meet the requirements of Specification Section 02200 and be in all respects acceptable to the Government. All areas receiving topsoil shall be hydroseeded with a mixture of native grasses and vegetation in all respects acceptable to the Government. The removal contractor shall be responsible for watering, mowing, and fertilizing seeded areas until a uniform growth of grass has been firmly established on the site.

2.2.9 Final Site Restoration

It is anticipated that final restoration of the KDC Kootenai Bluff property will include erosion control, tree and stump removal, removing asbestos contaminated soil to the depths established by the Government, furnishing, placing, and compacting common fill, granular fill for roadways accepted by the Government, loaming and hydroseeding, and restoring the site to original contours. The removal contractor will be required to provide, place, and compact all granular fill materials as specified in Specification Section 02200. All materials and installation shall be, in all respects, acceptable to the Government.

Section 3
Quality Assurance/Quality Control

3.1 General Requirements

Appendix B "Text Portion of Sampling and Quality Assurance Project Plan Developed by EPA" provides the basic quality assurance (QA) requirements associated with tasks conducted at the various Libby sites. The overall site DQOs are discussed in detail. The project task description (Section A5) states that media samples will be collected according to Standard Operating procedures provided by CDM, or as provided in the attachments to the Sampling and Quality Assurance Plan. Specific QA/QC requirements for the KDC Kootenai Bluff property are discussed in the following section.

3.2 Specific Requirements

Appendix B provides an overall QA/QC plan for conducting and reporting activities at the various Libby sites. For KDC Kootenai Bluff property activities, CDM's technical standard operating procedures (TSOPs) will be implemented as necessary. Basic requirements include such tasks as general site documentation, sampling of various media, records of deviations from standard procedures and protocols including the EPA's Sampling and Quality Assurance project Plan, custody control, sampling handling and storage, and document control. Specific procedures have also been generated for calibration and maintenance of field instruments.

As stated previously, specific sampling requirements have not been completed at this time. Once specific locations and numbers of samples and QC samples have been determined, with input and concurrence from the client, the pertinent information will be recorded in applicable site logbooks, forms or equivalents to ensure events, decisions, and situations can be reconstructed from the entries. Miscellaneous requirements are addressed by the approved Transportation and Disposal Plan.

TARGET SHEET

EPA REGION VIII

SUPERFUND DOCUMENT MANAGEMENT SYSTEM

DOCUMENT NUMBER: 2000532

SITE NAME: LIBBY ASBESTOS

DOCUMENT DATE: 08/14/2001

DOCUMENT NOT SCANNED

Due to one of the following reasons:

- ☑ PHOTOGRAPHS
- ☐ 3-DIMENSIONAL
- ☐ OVERSIZED
- ☐ AUDIO/VISUAL
- ☐ PERMANENTLY BOUND DOCUMENTS
- ☐ POOR LEGIBILITY
- ☐ OTHER
- ☐ NOT AVAILABLE
- ☐ TYPES OF DOCUMENTS NOT TO BE SCANNED (Data Packages, Data Validation, Sampling Data, CBI, Chain of Custody)

DOCUMENT DESCRIPTION:

APPENDIX A - Photographs of the Kootenai Bluff Property (10 total)

Contact the Superfund Records Center to view available document.
(303) 312-6473

Appendix B

Text Portion of Sampling and Quality Assurance Project Plan Developed by EPA

SAMPLING AND QUALITY ASSURANCE PROJECT PLAN
REVISION 1

FOR

Libby, Montana

Environmental Monitoring for Asbestos

Baseline Monitoring for Source Area and Residential Exposure to Tremolite-Actinolite Asbestos Fibers

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

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DOCUMENT REVISION LOG

Revision	Date	Major Changes
0	12/6/99	–
1	1/4/00	a. Revised text to clarify study design and DQOs b. Added SOP for surface water to allow collection and evaluation of surface water as a transport medium c. Added alternative SOP for asbestos analysis in soil that may have higher sensitivity than other methods. d. Added figures to help illustrate key steps from sample collection to analysis e. Added final SOPs as appendices to the revision.

Table of Contents

A. PROJECT TASK ORGANIZATION

A3 PROJECT MANAGEMENT

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A4 PROBLEM DEFINITION and BACKGROUND

Problem: This sampling plan has been developed in response to requests from the State of Montana, Lincoln County Health Board (meeting minutes, 11/23/99), and City officials of Libby, MT, to address questions and concems raised by citizens of Libby regarding possible ongoing exposures to asbestos fibers as a result of historical mining, processing and exportation of asbestos-containing vermiculite. Over 60 years of mining, milling, packaging and shipping of vermiculite at the mine and associated properties resulted in the environmental release of asbestos fibers during mining operations (McDonald et al., 1986; Amandus et al., 1987; Amandus and Wheeler; 1987; Amandus et al., 1978). Since closure of the mine in 1990, it is expected that production-related emissions have been greatly reduced or eliminated.

However, there are presently insufficient data to conclude that current exposures to residents in Libby and the surrounding area and occasional recreational visitors to the former mining areas are negligible. ***The purpose of this sampling effort is to acquire information suitable for supporting an exposure and risk assessment for current environmental conditions in Libby.***

Background: Asbestos is a generic term for a group of six naturally-occurring, fibrous silicate minerals that have been widely used in commercial products. Asbestos minerals fall into two groups or classes: serpentine asbestos and amphibole asbestos. Serpentine asbestos, which includes the mineral chrysotile, a magnesium silicate mineral, possesses relatively long and flexible crystalline fibers that are capable of being woven. Amphibole asbestos, which includes the minerals amosite, crocidolite, tremolite, anthophyllite, and actinolite, form crystalline fibers that are substantially more brittle than serpentine asbestos.

Asbestos is of potential health concern because chronic inhalation exposure to excessive levels of asbestos fibers suspended in air can result in lung disease such as asbestosis, mesothelioma, and lung cancer. Figure 1 presents a preliminary Site Conceptual Model which identifies exposure pathways by which asbestos fibers from mining-related sources might become entrained in air in Libby, leading to inhalation exposures of residents or workers. The site conceptual model will be refined as site data are acquired and an improved understanding of actual transport and exposure pathways is achieved.

Approach: This sampling plan describes the efforts planned by EPA to monitor and characterize asbestos-containing materials in and about the vicinity of Libby. The plan will be composed of two phases:

Phase 1: This is a rapid pilot-scale investigation that has two main objectives:

a) Obtain information on airborne asbestos levels in Libby in order to judge whether a time-critical intervention is needed to protect public health.

b) Obtain data on asbestos levels in potential source materials, and identify the most appropriate analytical methods to screen and quantify asbestos in source materials.

Phase 2: This will consist of a systematic evaluation of asbestos levels in air in Libby and in appropriate background locations, along with a systematic investigation to identify the actual or potential source(s) and release mechanism(s) of asbestos in Libby and the surrounding area. The implementation, pace and scope of Phase 2 and the methods used to collect and analyze samples in Phase 2 will be determined in large part by the results of the Phase 1 pilot study.

Interpretation. Analyses of asbestos fibers in air and other site media will determine the potential (or lack of potential) for human inhalation exposure under **present** conditions. The environmental fate and transport of asbestos fibers may be such that present measurement conditions (e.g. weather) and/or measurement techniques interfere with the ability to identify and/or quantify asbestos fibers in relevant exposure media (soil, dust, air, or water). Thus, while conclusions drawn from the implementation of this study are applicable to the present conditions at the site, they do not necessarily reflect conditions which may develop in the future.

A5 PROJECT TASK DESCRIPTION

To the extent possible, sampling will be conducted such that data will be meaningful for human exposure and risk assessment. Because the chief exposure pathway is air, emphasis will be placed on collection of air samples. In addition, to help identify potential sources and transport pathways for asbestos, samples of various bulk materials (mine waste, soil, dust, water, sediment) will also be collected in residential and non-residential areas.

Phase 1

Basic tasks needed to complete Phase 1 are listed below:

1. Collect samples of air, soil, dust, water, and insulation from selected locations in and around town, including a number of residential and/or commercial locations, as well as suspected source areas such as historical mining/processing/loading facilities.

2. Perform asbestos analyses on all air samples and a selected set of the dust, soil, insulation and water samples (those judged to be most likely to have either "high" or "low" concentrations) in order to obtain preliminary information on asbestos levels in air and other media, and to identify the optimum conditions for collection and analysis of bulk media.

At this time, the proposed sampling for Phase 1 consists of collection of environmental media from approximately 30 residences and 3 potential source areas. Residential sample locations will be selected from residences volunteering for multimedia sampling. In addition to the collection of samples within the residential area, samples may also be collected in commercial warehouses, agricultural buildings, or businesses in Libby, as needed to support the objectives of the On Scene Coordinator. Potential source area samples will be collected along the mine road (Rainy Creek Road) and at the Former Vermiculite Loading facility near the intersection of Rainy Creek Road and Highway 37.

Media samples will be collected according to Standard Operating Procedures provided by CDM, Inc. or as provided in the attachments to this Sampling and Quality Assurance Plan.

Phase 2

The purpose of Phase 2 is to design and implement a systematic program of sample collection and analysis to fully characterize levels of health risk from long-term inhalation exposure to asbestos in air, and to identify any actual or potential sources and release mechanisms of asbestos. Specific tasks needed to implement Phase 2 will be selected after completion of Phase 1.

A6 QUALITY OBJECTIVES and CRITERIA for MEASUREMENT DATA

Two types of objectives are identified in this quality assurance project plan (QAPP): general objectives and data quality objectives (DQOs). General objectives are statements of practical goals that, if realized, will substantially contribute to achieving the purpose of the study. Development of DQOs is a process that is intended to ensure that task objectives are clearly defined and that data collected are appropriate and of sufficient quality to satisfy the objectives.

Phase 1 General Objective 1

Determine whether current airborne levels of asbestos in Libby are high enough to warrant a time-critical intervention.

Phase 1 General Objective 2

Obtain preliminary data on asbestos concentrations in potential source materials for air (e.g., dust, soil, mine waste), and determine the optimum conditions for sampling and quantifying asbestos levels in source materials.

Phase 2 General Objective

The general objectives for Phase 2 is to collect reliable and systematic data on asbestos levels in air and other media in Libby to allow a reliable evaluation of current human exposure and health risk from asbestos as well as an identification of sources of unacceptable levels of asbestos in air.

Data Quality Objective Process

The DQO process can be an iterative process which is designed to focus on the decisions that must be made and to help ensure that the site activities that acquire data are logical, scientifically defensible, and cost effective. The DQO process is intended to:

- Ensure that task objectives are clearly defined
- Determine anticipated uses of the data
- Determine what environmental data are necessary to meet these objectives
- Ensure that the data collected are of adequate quantity and quality for the intended use

The three stages of the DQO process are identified below and a discussion of how they have been applied in the characterization study described herein. The three stages are undertaken in an interactive and iterative manner, whereby all the DQO elements are continually reviewed and re-evaluated until there is reasonable assurance that suitable data for decision making will be attained.

- Stage I - Identify Decision Types: Stage I defines the types of decisions that will be made by identifying data uses, evaluating available data, developing a conceptual model, and specifying objectives for the project. The conceptual model facilitates identification of decisions that may be made, the end use of the data collected, and the potential deficiencies in the existing information.

- Stage II - Identify Data Uses/Needs: Stage II stipulates criteria for determining data adequacy. This stage involves specifying the quantity and quality of data necessary to meet the Stage I objectives. EPA's Data Usability for Risk Assessment Guidance (DURA) outlines general and specific recommendations for data adequacy. This includes identification of data uses and data types, and identification of data quality and quantity needs.

- Stage III - Design Data Collection Program: Stage III specifies the methods by which data of acceptable quality and quantity will be obtained to make decisions. This information is provided in the SOP.

Through utilization of the DQO process, as defined in EPA guidance (EPA540-R-93-071 and -078, Sep 1993), this QAPP will use several terms that are specifically defined to avoid confusion that might result from any misunderstanding of their use. For each of the tasks identified within this QAPP, a "Task Objective" is specifically defined. The Task Objective is a concise statement of the problem to be addressed by activities under this task. For each Task Objective, a decision (or series of decisions) is identified which addresses the problem contained in the Task Objective.

For each decision, the data necessary to make the decision are identified and described. For all analytical data, quality assurance objectives are specified that describe the minimum quality of data necessary to support the specified decision or test the hypotheses. These quality assurance objectives are specified as objectives for precision, accuracy, representativeness, comparability, and completeness. In addition, data review and validation procedures are specified in the QAPP that evaluate how well the analytical data meet these quality assurance objectives and whether or not the data are of sufficient quality for the intended usage.

The following sections apply the DQO process to the Libby Project, Stage I and Stage II. Stage III is discussed later (see Section B), but sampling and analysis methods presented in this section are considered tentative and final decisions on optimum sampling and analytical methods will be delayed until the findings of Phase 1 are available.

DQO Stage I - Identifying Decision Types

Stage I of the DQO process identifies a primary question and secondary questions that need to be resolved at the completion of the sampling and analyses program.

þ PRIMARY QUESTION (Phase 1): Are current airborne levels of asbestos sufficiently high to warrant a time-critical intervention?

þ SECONDARY QUESTION (Phase 1): What are the most likely sources of asbestos in air, and what are the best methods for quantifying asbestos levels in potential source materials?

DQO Stage II - Identifying Data Uses/Needs

Stage II of the DQO process also determines what type and quality of data are needed to answer the questions developed in Stage I. EPA has developed a seven-step method for developing the DQOs. This seven-step method is applied below in order to define the data requirements needed to achieve the primary and secondary objectives of the Phase 1 evaluation (and summarized in Table 1).

Primary Objective: Evaluate The Need For Time-critical Action

1. State the Problem

The problem to be addressed by this study is that citizens of Libby appear to have an increased incidence of asbestos-related disease, but there are no data to determine if this disease is attributable solely to historic exposures, or whether current exposures are of continuing health concern.

2. Identify the Decision

The first decision to be made is whether or not time-critical intervention is needed to protect public health. If current exposures are not high enough to warrant time-critical intervention, the next decision is whether or not non-time-critical remedial action is needed.

3. Identify Inputs to the Decision

Decisions on the need for time-critical intervention or non-time-critical remediation will be based on estimated risk of lung disease in current residents and workers in Libby. Two types of lung disease are of concern: asbestosis (a non-cancer effect) and lung cancer and mesothelioma (cancer effects). Limited data suggest that chronic exposures to chrysotile fiber levels of 5-20 f/mL can cause asbestotic changes (ATSDR 1999), but data are not sufficient to derive a reliable chronic MRL or RfC for asbestosis. However, methods have been established for estimating the excess risk of lung cancer and/or mesothelioma, and it is considered likely that exposure levels that protect against unacceptable risk of lung cancer/mesothelioma (in the range of 0.1 to 0.0001 f/mL; see below) will also protect against unacceptable risk of asbestosis.

The basic equation used to estimate cancer risk is:

Risk = Concentration (f/mL) * Unit Risk (risk per f/mL)

Thus, the data needs are an **estimate of airborne asbestos concentration** and an **estimate of cancer risk per unit concentration.**

Measurement of Asbestos Concentration in Air

There are a number of techniques for measuring asbestos fibers in air, all of which are based on visual identification of structures as asbestos fibers. Most historical human health data and many regulatory limits for asbestos exposure in air are based upon asbestos fiber concentrations measured using phase contrast microscopy (PCM) (see Table 2). In this method, **fiber material** is defined as having a length >5 microns and an aspect ratio (length to diameter ratio) of three or more. Results are generally reported as fibers per milliliter of air (f/mL).

More recently, a number of other methods have been developed for quantitative or qualitative measurement of asbestos fibers in air, including transmission electron microscopy (TEM), and x-ray diffraction (XRD). These methods are generally more sensitive than PCM, and also allow visualization and quantification of asbestos fibers that are thinner than those visible under PCM. This is important because it is likely that the toxicity of long thin fibers is greater than that of shorter thicker fibers (Berman et al., 1995). Based on this, **asbestos fibers in air will be quantified by TEM.** Detailed rules for identifying asbestos fibers of biological concern by TEM are provided in ISO method 10312. This method is an international standard procedure that is recommended for quantifying asbestos fibers that are believed to be the chief source of human health concern (Berman and Crump 1999).

Unit Risk for Asbestos in Air

It is mandatory that the unit risk value used to calculate cancer risk be based on the same type of asbestos measurement technique as used to quantify asbestos concentration in air. That is, it is not correct to estimate risk by multiplying a concentration based on TEM fibers per mL by a unit risk based on PCM fibers per mL. Thus, risk-based values shown in Table 2 cannot be used to interpret measurements based on TEM. EPA has developed a model for predicting risk from mesothelioma and lung cancer from TEM-based measurements of asbestos in air (USEPA 1986), and this method has been revised and improved by Berman and Crump (1999) to incorporate the influence of fiber length. The risk factors for the modified mesothelioma and lung cancer model are summarized in Table 3. Note that the risk factor depends not only on the number of TEM fibers greater than 5 um in length, but also on the fraction of all fibers that are longer than 10 um.

The toxicity factors shown in Table 3 are based on the best data currently available, but it is important to recognize that these toxicity factors are uncertain. This is because the values are derived from studies in which important details of exposure (level, duration, fiber size distribution, etc.) are not always known. In particular, the importance of fiber size (length, thickness) and fiber type (tremolite, chrysotile, etc.) on toxicity is difficult to quantify and remains a source of discussion.

4. Define the Study Boundaries

Spatial Bounds

The spatial bounds to be investigated in this project include the community of Libby, and areas associated with former mining activities near the town. Appropriate background areas may be selected for comparative evaluation.

Temporal Bounds

Asbestos fibers enter air mainly as a result of resuspension due to mechanical disturbance or wind erosion. Because mechanical and wind forces may vary substantially over time, asbestos levels in air are also expected to vary substantially over time. Thus, estimates of long term average concentrations are inherently preferable to measurements based on grab samples. Therefore, multiple samples of air will be collected over time at locations of interest. It is likely the highest levels will tend to occur in summer, when source areas tend to be dry and wind and mechanical forces result in significant dust resuspension.

5. Develop a Decision Rule

EPA must identify an actual or potential threat to human health or the environment in order to initiate a time-critical intervention at a site. Based on current EPA guidelines, a lifetime excess cancer risk of 1E-04 is considered to be at the upper end of the acceptable risk range for chronic (lifetime) exposure. Based on this, this Phase 1 study will use an excess cancer risk of about 1E-03 as the appropriate boundary for decision-making. That is, if asbestos levels in air correspond to an estimated cancer risk of about 1E-03 or higher, time critical actions to identify sources and find appropriate and effective interventions will be considered. If estimated cancer risks from asbestos in Phase 1 air samples do not exceed a level of about 1E-03, then further studies may be pursued to determine if risk levels might exceed 1E-03 at other times or in other places, or if risks might exceed an acceptable chronic risk level (e.g., 1E-04).

6. Specify Limits on Decision Errors

The null hypothesis that will be tested in Phase 1 is that indoor air levels in Libby are sufficiently high to warrant time-critical intervention. Two types of decision error are possible when making this decision:

Type I Error: Rejecting the null hypothesis when it really is true. That is, the site is declared to be below a risk level of 1E-03 when it is really above this level.

Type II Error: Accepting the null hypothesis when it actually is false. That is, the site is declared to be of time-critical concern when it actually is not.

The limits on these two types of errors are risk management judgements. In order to minimize the chances of a Type 1 error (a "false negative"), the decision will be based on the highest concentration of asbestos fibers detected in any currently-occupied residential or occupational building evaluated in the Phase 1 investigation. If one or more samples exceeds the 1E-03 risk level, time critical action may be needed. However, additional samples may be collected to confirm the original measurement and to refine the risk estimate. Because of the time variability in asbestos levels in air, final decisions may be delayed until additional data have been collected, including data in the summer when airborne resuspension and transport of asbestos fibers in outdoor air is considered to be more likely than in winter.

7. Optimize the Design for Obtaining Results

Additional indoor and/or outdoor air samples may be collected and incorporated into either Phase 1 and/or Phase 2 as data become available on actual airborne exposure and risk levels.

Secondary Objective: Preliminary Investigation of Source Materials

Table 4 provides a summary of the seven-step DQO process for achieving the secondary objective. The following text describes each of the DQO steps in detail.

1. State the Problem

The problem to be addressed by this portion of the study is that most methods currently available for measuring asbestos in solid materials (e.g., soil, dust, bulk insulation, mine waste, etc.) are relatively insensitive, and it is not known whether impacts of historic or ongoing asbestos releases on these media can be detected by these techniques.

2. Identify the Decision

The decision to be made is whether analysis of potential source materials and/or transport media in and about the mine (e.g., mine waste, surface water) and in and about the community of Libby (e.g., yard soil, house dust, garden soil) can be reliably quantified using available techniques. If so, then source areas judged to be of potential concern may be removed at the discretion of the OSC. Alternatively, additional sampling and analysis of potential source material may be pursed as needed to identify impacted areas and to focus on sources of unacceptable asbestos levels in air.

3. Identify Inputs to the Decision

Asbestos Measurements in Environmental Media

Inputs to the decision will be the results of asbestos analyses of each medium using the best available technique(s), as follows:

Medium	Proposed Method	
	Sample Preparation	Sample Analysis
Yard soil Garden soil Road soil Mine waste Bulk insulation	Collect bulk sample, place on slide	PLM of bulk material
	Collect bulk sample, dry	Visible reflective infrared spectroscopy
	Separate respirable dust fraction using Superfund method, collect dust on filter, collapse filter, prepare TEM grids	TEM of respirable dust
Indoor Dust	Microvacuum into cassette, suspend dust in water/alcohol, collect on filter, dry ash, prepare TEM grids	TEM
Surface Water	Collect bulk sample, filter, collapse filter, prepare TEM grids	TEM

These methods have been selected because they are judged to be the most likely to yield results that will allow qualitative or quantitative evaluation of asbestos levels in environmental media. Note that several alternative methods are identified for soil and related bulk materials. At present, it is not known which of these will be the most appropriate. It is envisioned that all samples will be screened using visible infrared spectroscopy, since this method is very fast and inexpensive. If successful, the results of this method can be used to rank-order samples into "high", "medium" and "low" concentration ranges. For quantitative assessment, it is envisioned that all samples will be analyzed by PLM, since this method is fast and relatively less expensive than the Superfund TEM method. This evaluation will begin with samples that are known or suspected to be high in asbestos concentration, based either on the infrared results and/or field observations such as the presence of visible levels of vermiculite, proximity to known sources or waste materials, etc. The analyses will continue through the samples to those that are known or suspected to contain "low" levels. When asbestos fiber concentrations are consistently below the detection limit, further analyses by PLM may be discontinued. After the results of the infrared and the PLM analyses are available, a set of samples will be selected for analysis by the Superfund method. This method is expected to be the most sensitive, because it includes a preliminary separation of respirable asbestos fibers from the bulk material, and because quantification is by TEM rather than PLM. However, the method is not yet in wide use, and is associated with a relatively high cost and slow turnaround time. It is for this reason that only about 15-21 samples will be evaluated by this approach. This set will be composed of approximately 5-7 in each of three categories: "high", "medium", and "low". Comparison of results across these three methods will allow an evaluation of which method(s) is (are) most appropriate for on-going evaluation of soils and related materials at the site.

For the other media (dust, surface water), all samples collected will be analyzed by the analytical methods indicated above. A comparison of results across samples will be used to determine whether the method is likely to be reliable and useful for further evaluation of site samples.

Community Interview

EPA will administer a community interview to numerous Libby residents including residents of each household sampled. These interviews will help gauge community members' level awareness about asbestos, their health concerns about asbestos, their knowledge about activities that may results in asbestos exposure, as well as possible sources of asbestos-bearing material. This information may help explain observed asbestos levels in samples from the home. A copy of the interview questionnaire is provided in Section E (Appendices).

4. Define the Study Boundaries

Spatial Bounds

The spatial bounds to be investigated in this project include the community of Libby, and areas associated with former mining activities near the town.

Temporal Bounds

Asbestos levels in source or transport material are expected to be relatively stable. Thus, the time when source area samples are collected is not judged to be critical.

5. Develop a Decision Rule

If no observable difference in asbestos concentration can be detected between the two classes of samples ("high" vs "low"), it will be concluded that a) either the medium is not impacted, or b) the measurement technique is not sufficiently sensitive. If a difference can be detected, it will be concluded that there is an impact to that medium, along with an actual or potential release to the environment, and that the current method can be used to further investigate and quantify that release.

6. Specify Limits on Decision Errors

Because the decision to be made is mainly with regard to method adequacy, no quantitative rules are needed to define decision errors.

7. Optimize the Design for Obtaining Results

Additional source area samples may be collected and incorporated into either Phase 1 and/or Phase 2 as data become available on the ability of current methods to detect and quantify asbestos fibers in each medium.

PARCC Requirements

Within this QAPP, quantitative and qualitative limits are defined for precision, accuracy, representativeness, comparability and analytical completeness. Reporting limits for asbestos fibers are set by the analytical laboratory based on environmental matrix, historical data, and comparison to EPA limits for CLP and other methods. Quantitative limits are also defined by microscopy (light microscopy or TEM) for method detection limits, and for method reporting limits or method quantitation limits. The QA procedures outlined in this section are intended to ensure data quality and to administer corrective actions with the goal of producing data that satisfy the following requirements. General guidelines, policies, and procedures to achieve these objectives are presented below. Where additional, detailed, procedures are required to attain QA objectives and to describe specific methods, these are provided in the SOPs (see attached). The following PARCC requirements apply to more standard chemical analytical analyses, and partially to asbestos analyses (e.g., identifying physico-chemical make-up of specific fibers)

Precision: Precision is defined as the agreement between a set of replicate measurements without assumption or knowledge of the true value. It is a measure of agreement among individual measurements of the same property under prescribed similar conditions. Agreement is expressed as either the relative percent difference (RPD) for duplicate measurements or the range and standard deviation for larger numbers of replicates. The RPD will be reported on required 5% laboratory duplicates.

Accuracy: Accuracy is a measure of the closeness of individual measurements to the "true" value. Accuracy usually is expressed as a percentage of that value. For a variety of analytical procedures, standard reference materials traceable to or available from National Institute of Standards and Technology (NIST, formerly National Bureau of Standards) or other sources can be used to determine accuracy of measurements. Accuracy will be measured as the percent recovery (%R) of an analyte in a reference standard or spiked samples (>3 at each selected concentration range) that span the limit of linearity for the method.

Ideally, precision and accuracy estimates should represent the entire measurement process, including sampling, analysis, calibration, and other components. From a practical perspective, these estimates usually represent only a portion of the measurement process that occurs in the analytical lab.

Representativeness: Representativeness is the degree to which data accurately and precisely represent characteristics of a population, parameter variations at a sampling point, or an environmental condition. For this QAPP, data and samples representative of chemical and biological exposures in the study and reference areas are to be collected from randomly chosen residences.

Comparability: Data are comparable if site considerations, collection techniques, and measurement procedures, methods, and reporting are equivalent for the samples within a sample set. A qualitative assessment of data comparability will be made of applicable data sets. These criteria allow comparison of data from different sources. Comparable data will be obtained by specifying standard units for physical measurements and standard procedures for sample collection, processing, and analysis. Please see the attached SOPs for sampling and analysis procedures.

Completeness: Data are considered complete when a prescribed percentage of the total intended measurements and samples are obtained. Analytical completeness is defined as the percentage of valid analytical results requested, and >90% of analyzed samples should have results reported. For this sampling program, a minimum of 80 percent of the planned collection of individual samples for quantification and a minimum of 30 percent of related parameters (e.g., physical measurements, fiber type, etc.) must be obtained to achieve a satisfactory level of data completeness.

Method Detection Limits (applicable to chemical analyses only): Method detection limits (MDLs) are minimum values that can be reliably measured to identify the analyte as being present in the matrix, versus method quantitation limits are the minimum values that can be quantitated with reasonable scientific confidence. The method will also have a maximum linear value in most situations, and analyses should occur within this limit of linearity range. See applicable operating procedures for details.

Table 1. DQOs for Primary Objective: Evaluate the Need for Time-Critical Action

DQO Step	Description
1. Define the problem	The citizens of Libby appear to have an increased incidence of asbestos-related disease, but there are no data to determine if this disease is attributable solely to historic exposures, or whether current exposures are of continuing health concern.
2. Identify the decision	Is time-critical action needed to protect public health? If yes, identify appropriate action and intervene as necessary If no, determine whether or not non-time-critical remediation is necessary
3. Identify inputs to decision	Level of concern for human health (lifetime excess cancer risk of 1E-03) Estimate of airborne asbestos concentration, and cancer risk per unit concentration.
4. Define study boundaries	*Spatial bounds*: Community of Libby, including former mining, milling and processing areas and areas potentially impacted as defined by meteorological conditions. If necessary, appropriate background areas are also included (precise locations to be defined). *Temporal bounds*: multiple air samples will be collected in areas associated with former mining activities near the town seasonally throughout the year
5. Define decision rule	If asbestos levels in indoor air $\geq$ 1E-03 risk level, consider the need for time-critical intervention. If asbestos levels in indoor air < 1E-03 risk level, time-critical intervention may not be necessary. However, additional studies may be needed to determine if non-time-critical remediation is necessary, or if levels might exceed 1E-03 risk levels under different conditions (e.g., seasonal variation)
6. Specify limits on decision errors	Risk management decisions will be based on the highest airborne asbestos concentration found in any residential or occupational building.
7. Optimize the design	Incorporate new information as data become available on actual airborne exposure and risk levels.

Table 2: Summary of Available PCM-Based Exposure Levels for Asbestos

Agency	Description	Nominal Value	Reference
ACGIH	TLV-TWA	0.1 f/cc	ACGIH, 1998
NIOSH	REL 100 minute TWA in a 400L sample (all forms)	0.1 f/cc	NIOSH 1999
OSHA	PEL (TWA) all forms	0.1 f/cc	OSHA 1998 29 CFR 1919.1001
OSHA	PEL (ceiling) 30 minute average - all forms	1.0 f/cc	OSHA 1998 29 CFR 1926.1101
EPA (IRIS)	Inhalation unit risk - all forms	0.23 per (f/mL)	IRIS 1999
EPA (OW)	MCL (f>10 um in length) all forms	7 MFL[a]	EPA 1998

[a] MFL = million fibers per liter

TABLE 3. Unit Risk for Inhalation of Asbestos

Population	Percentage of Fibers Greater than 10 um in Length										
	0.50%	1%	2%	4%	6%	10%	15%	20%	30%	40%	50%
Male Nonsmoker											
Lung Cancer	1.0E-02	1.6E-02	3.0E-02	5.4E-02	8.0E-02	1.3E-01	1.9E-01	2.6E-01	3.8E-01	5.0E-01	6.4E-01
Mesotheliomas	1.1E-01	1.9E-01	3.2E-01	6.2E-01	9.0E-01	1.5E+00	2.2E+00	2.9E+00	4.3E+00	5.8E+00	7.2E+00
Total	1.2E-01	2.0E-01	3.5E-01	6.7E-01	9.8E-01	1.6E+00	2.4E+00	3.2E+00	4.7E+00	6.3E+00	7.8E+00
Female Nonsmoker											
Lung Cancer	7.6E-03	1.2E-02	2.2E-02	4.0E-02	6.0E-02	9.6E-02	1.4E-01	1.9E-01	2.8E-01	3.8E-01	4.8E-01
Mesotheliomas	1.3E-01	2.0E-01	3.6E-01	6.8E-01	1.0E+00	1.7E+00	2.5E+00	3.3E+00	4.9E+00	6.5E+00	8.1E+00
Total	1.4E-01	2.1E-01	3.8E-01	7.2E-01	1.1E+00	1.8E+00	2.6E+00	3.5E+00	5.1E+00	6.8E+00	8.5E+00
Mean Total for Nonsmokers	2.6E-01	4.1E-01	7.3E-01	1.4E+00	2.0E+00	3.4E+00	5.0E+00	6.6E+00	9.8E+00	1.3E+01	1.6E+01
Male Smoker											
Lung Cancer	9.4E-02	1.5E-01	2.6E-01	5.0E-01	7.4E-01	1.2E+00	1.8E+00	2.4E+00	3.5E+00	4.7E+00	5.9E+00
Mesotheliomas	7.6E-02	1.2E-01	2.2E-01	4.2E-01	6.0E-01	9.8E-01	1.5E+00	1.9E+00	2.9E+00	3.8E+00	4.8E+00
Total	1.7E-01	2.8E-01	4.8E-01	9.2E-01	1.3E+00	2.2E+00	3.2E+00	4.3E+00	6.4E+00	8.5E+00	1.1E+01
Female Smoker											
Lung Cancer	6.4E-02	1.0E-01	1.8E-01	3.4E-01	5.0E-01	8.2E-01	1.2E+00	1.6E+00	2.4E+00	3.2E+00	4.0E+00
Mesotheliomas	1.1E-01	1.9E-01	3.2E-01	6.2E-01	9.0E-01	1.5E+00	2.2E+00	2.9E+00	4.3E+00	5.8E+00	7.2E+00
Total	1.8E-01	2.9E-01	5.0E-01	9.6E-01	1.4E+00	2.3E+00	3.4E+00	4.5E+00	6.7E+00	9.0E+00	1.1E+01
Mean Total for Smokers	1.7E-01	2.8E-01	4.9E-01	9.4E-01	1.4E+00	2.2E+00	3.3E+00	4.4E+00	6.6E+00	8.8E+00	1.1E+01

Source: Berman and Crump (1999)